



Engagement and attrition in Internet smoking cessation interventions: Insights from a cross-sectional survey of “one-hit-wonders”



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ARTICLE INFO

Article history:

Received 28 March 2016

Received in revised form 1 July 2016

Accepted 3 July 2016

Available online 7 July 2016

Keywords:

Smoking cessation

Engagement

Attrition

Incentive

Survey methods

ABSTRACT

Introduction: Internet interventions can reach large numbers of individuals. However, low levels of engagement and high rates of follow-up attrition are common, presenting major challenges to evaluation. This study investigated why registrants of an Internet smoking cessation intervention did not return after joining (“one hit wonders”), and explored the impact of graduated incentives on survey response rates and responder characteristics. **Methods:** A sample of “one hit wonders” that registered on a free smoking cessation website between 2014 and 2015 were surveyed. The initial invitation contained no incentive. Subsequent invitations were sent to random subsamples of non-responders from each previous wave offering \$25 and \$50 respectively. Descriptive statistics characterized respondents on demographic characteristics, reasons for not returning, and length of time since last visit. Differences were investigated with Fisher’s Exact tests, Kruskal-Wallis, and logistic regression.

Results: Of 8779 users who received the initial invitation, 132 completed the survey (1.5%). Among those subsequently offered a \$25 incentive, 127 (3.7%) responded. Among those offered a \$50 incentive, 97 responded (5.7%). The most common reasons endorsed for not returning were being unable to quit (51%), not having enough time (33%), having forgotten about the website (28%), and not being ready to quit (21%). Notably, however, 23% reported not returning because they had successfully quit smoking. Paid incentives yielded a higher proportion of individuals who were still smoking than the \$0 incentive (72% vs. 61%). Among \$0 and \$25 responders, likelihood of survey response decreased with time since registration; the \$50 incentive removed the negative effect of time-since-registration on probability of response.

Conclusions: One third of participants that had disengaged from an Internet intervention reported abstinence at follow-up, suggesting that low levels of engagement are not synonymous with treatment failure in all cases. Paid incentives above \$25 may be needed to elicit survey responses, especially among those with longer intervals of disengagement from an intervention.

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1. Introduction

Internet interventions offer the promise of efficiently delivering health behavior change programs to large numbers of individuals (Fox, 2011; North American Quitline Consortium, 2014; Alere Wellbeing Inc., 2014; van Mierlo et al., 2012; Wangberg et al., 2011; Cobb and Graham, 2006). However, low levels of intervention engagement and high follow-up attrition are commonly observed in Internet studies (Strecher et al., 2008; Richardson et al., 2013; Eysenbach, 2005; Neve et al., 2010; Crutzen et al., 2011; Schwarzer and Satow, 2012). Each of these phenomena presents distinct challenges to

developers attempting to optimize the impact of Internet interventions and to researchers attempting to measure their efficacy or effectiveness.

Engagement with Internet interventions has been conceptualized to include 1) *amount of exposure* or use, and 2) *skills practice*, or the completion of activities or exercises that teach or reinforce knowledge or behavior related to the outcome of interest (Danaher et al., 2009; Ritterband et al., 2009). Amount of exposure can be easily, unobtrusively, and directly measured using automated tracking mechanisms, whereas measurement of skills practice typically requires participant self-report (Danaher et al., 2009). Consequently, because measuring skills practice is more effortful for both the participant and the researcher, amount of exposure is frequently used as a proxy for overall engagement (Sawesi et al., 2016). Multiple measures for amount of exposure typically are available, but the most common are number of site visits, number of page views, and session duration. One study that measured skills practice as “number of modules completed per session” found

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that it significantly predicted outcomes, while amount of exposure did not (Donkin et al., 2013).

However engagement is defined and measured, low levels are commonly reported in studies of Internet interventions across numerous domains (Strecher et al., 2008; Richardson et al., 2013; Schwarzer and Satow, 2012; Cobb et al., 2005; Munoz et al., 2009; Pike et al., 2007; Saul et al., 2007; Nash et al., 2015; Kohl et al., 2013). Eysenbach has noted that this phenomenon of low engagement (or “non-usage attrition”) is so common it is “one of the fundamental characteristics and methodological challenges in the evaluation of eHealth applications” (p.2) (Eysenbach, 2005). Participants commonly fail to use interventions to the full extent intended, whether that is reflected as the duration of time, the proportion of the intervention they are exposed to, or completion of key activities. Many studies have reported that a large proportion of users make only one visit and never return (Farvolden et al., 2005), even after providing detailed personal information in a registration process (Nash et al., 2015; Etter, 2005) or completing an extensive battery of survey instruments (Christensen et al., 2004). Christensen et al. (2006) have referred to these users as “one hit wonders.”

The assumption regarding low rates of engagement with Internet interventions is that participants may fail to receive an adequate “dose” to promote behavior change. A substantial number of studies have demonstrated an association between greater use of Internet interventions and improved outcomes for general health behavior change (Schweier et al., 2014; Ware et al., 2008; Cobb and Poirier, 2014; Poelman et al., 2013), as well as for smoking cessation specifically (Cobb et al., 2005; Pike et al., 2007; Saul et al., 2007; Danaher et al., 2008; Rabiou et al., 2008; Japuntich et al., 2006; Civljak et al., 2013), supporting the notion that “more is better.” Two recent reports used statistical methods to account for the possibility of self-selection bias that is inherent in these kinds of associations, and found that use of an Internet smoking cessation community predicted abstinence (Graham et al., 2015; Papandonatos et al., 2016). Several ongoing studies are investigating strategies to boost website engagement (Alley et al., 2014; Denney-Wilson et al., 2015; Graham et al., 2013; Ramo et al., 2015; Thrul et al., 2015), but an unanswered question is why many people who register for online interventions never come back after an initial visit. A better understanding of reasons why people do not return to online cessation interventions could provide clearer insights into this “law of attrition” (Eysenbach, 2005) and potentially aid efforts to target re-engagement strategies for those who might benefit most from them.

To investigate reasons why people do not return to online interventions after registering, however, it is necessary to reach them for data collection. High rates of follow-up attrition (low response rates) are also observed in Internet interventions (Murray et al., 2009; Mathieu et al., 2013), making this kind of inquiry inherently challenging. One problematic implication of follow-up attrition specific to smoking cessation relates to the evaluation of outcomes. Intervention effectiveness is commonly evaluated using the “intent to treat” approach in which all smokers randomized to treatment are counted in outcome analyses, with those lost to follow-up presumed to be smoking. In a scenario where follow-up attrition is high, quit rates may be grossly underestimated. Indeed, systematic reviews and meta-analyses of the effectiveness of Internet interventions for smoking cessation have reported only modest findings, noting the systemic problem of attrition (Civljak et al., 2013). Few studies have explicitly addressed abstinence outcomes among survey non-responders and findings have been mixed. In a small study out of Sweden, Tomson et al. (2005) made additional efforts to reach non-responders to a quitline follow-up survey. They found that 39% (18/46) of those reached through these additional efforts reported being abstinent compared to 31% (354/1131) of initial survey responders, a non-significant difference. In another quitline study, Lien et al. (2016) found that study participants who required the most contacts for follow-up survey completion were the least likely to be abstinent.

One effective strategy for increasing response rates to electronic health surveys is the use of monetary incentives (David and Ware, 2014). However, little is known about the optimal incentive level that maximizes response rates while making the best use of study resources, or about the characteristics of individuals that respond to varying incentive levels. Previous research has shown that for hard-to-reach populations or study topics involving social stigma, a higher incentive may be needed (Khosropour and Sullivan, 2011). An observational study by Cobb et al. (2005) surveyed 1501 users who had registered on an Internet smoking cessation program 3 months prior. Of the 1316 surveys that were delivered successfully, 181 were completed without an incentive, yielding an initial response rate of 13.8%. The use of graduated incentives (\$20 for initial non-responders, \$40 for non-responders to the \$20 survey) increased the overall response rate to 29.3% (385/1316). Their results suggest that graduated incentives may be a useful strategy for recruitment when resources are limited, allowing larger incentives to be offered to more difficult to reach participants while avoiding compensating users who were willing to participate for free. However, no information was provided about the characteristics of responders at the different incentive levels or their smoking outcomes at the time of survey completion.

The primary purpose of this study was to gain insight into the reasons for low levels of engagement with an Internet smoking cessation intervention. Among the “one hit wonders” on an Internet smoking cessation program, we were interested in determining the reasons that users did not return after an initial visit, and whether these reasons were related to their smoking status and/or perceived quality of the intervention itself. In addition, we sought to investigate the impact of graduated monetary incentives in boosting response rates among individuals that had disengaged from the intervention. We were specifically interested in determining whether higher incentives would yield different types of respondents in terms of demographic or smoking characteristics. Given the ubiquity of low levels of engagement and high follow-up attrition across a range of Internet interventions, our aim was to add to the relatively scarce but growing literature about Internet intervention engagement and disengagement.

2. Methods

2.1. Research setting

BecomeAnEX.org is an evidence-based smoking cessation program run by Truth Initiative (formerly the American Legacy Foundation) (Richardson et al., 2013; McCausland et al., 2011). Launched in 2008, the website is grounded in principles from the U.S. Public Health Service Clinical Practice Guideline for Treating Tobacco Use and Dependence (Fiore et al., 2008) and Social Cognitive Theory (Bandura, 1977). Multiple rounds of usability testing informed the original version of the site (Graham et al., 2013), and a continuous quality improvement process has guided subsequent enhancements and modifications. The site is designed to educate smokers and enhance self-efficacy for quitting through didactic content designed to help smokers prepare for quit day, cope with slips, and prevent relapse; videos about addiction and medication; a series of interactive tools and exercises; a large online support community of current and former smokers; and a companion text message intervention. A checklist displays whether each of the site's core components has been used and allows users to access various components of the quit plan in the order they desire, rather than requiring them to complete the program in a step-wise fashion. This strategy was implemented to help ensure that users explore personally relevant sections more readily. The site can be browsed anonymously but to save information, post to the community, or sign-up for text messages, visitors must register.

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